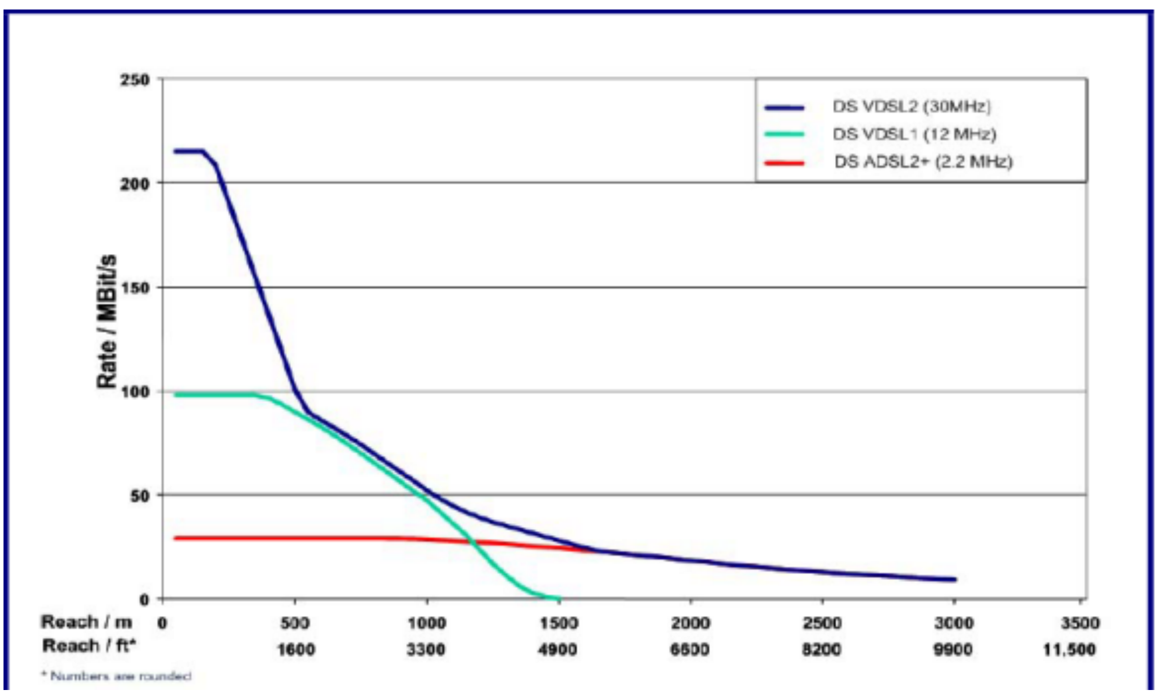
IV. Discussion

A. Model Design

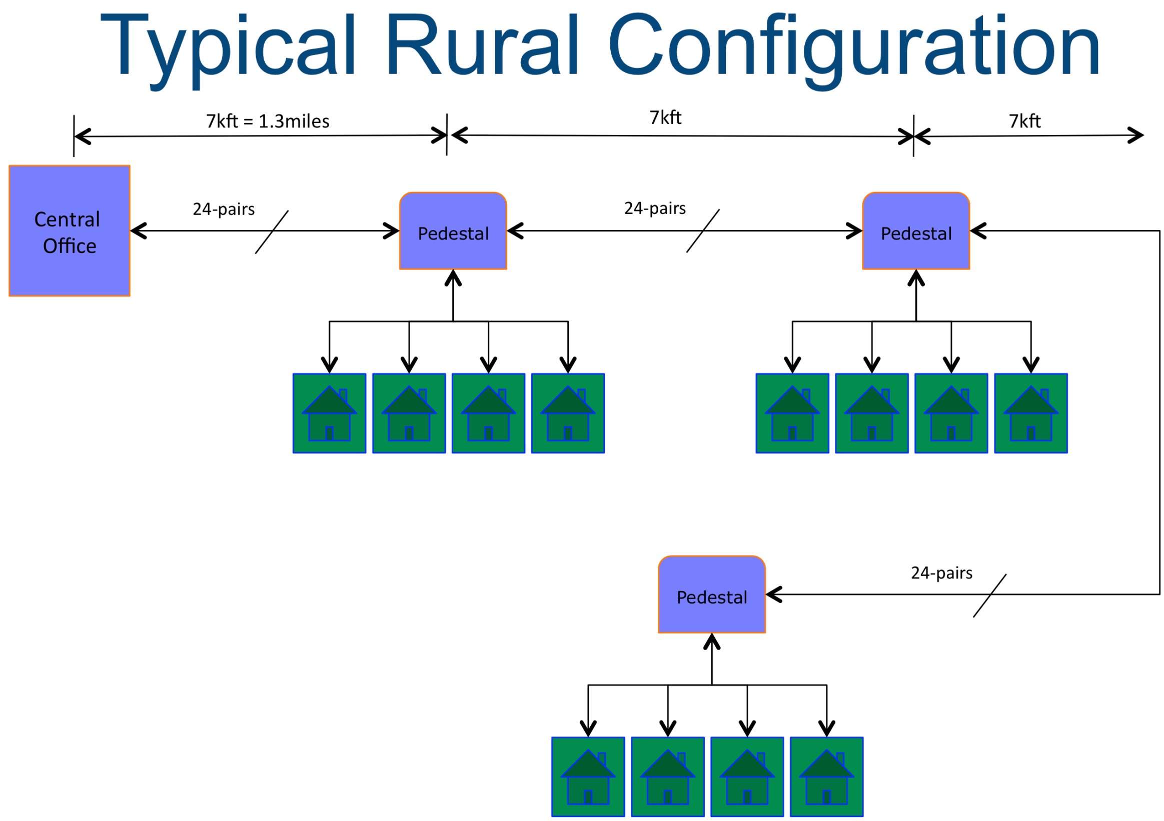
1. What wireline network technology and design should the model use to calculate costs, and how should the model calculate the terminal value of the network?

Looking at work done in the UK as a reference and realizing that there are much greater distances and many more people in America even if the total proposed $9 billion over 5 years was matched by participating Telcos, it would not put much of a scratch in the overall need in America – if optical fiber-based approaches were to be considered at all. In the UK the Broadband Stakeholders Group commissioned a report by Analysys Mason (BSG Report: The costs of deploying fibre-based next generation broadband infrastructure – 8 September 2008) on installing optical fiber to the whole of the UK. Their report showed a cost of £24.5 billion to install FTTP (GPON) nationwide, £28.8 billion to install FTTP (Point-to-Point, e.g.: Gigabit Ethernet), and £5.1 billion to install FTTN/VDSL. (The UK (British Isles) cover an area about the size of New Mexico.)

xDSL-based approaches make use of what has been called the trillion-dollar asset of incumbent US telcos – the copper twisted pairs that go into each residence. Fiber-based alternatives look to replace this still useful asset at enormous expense. The architecture of the telephone access network has not changed in the 130+ years since the telephone was patented. By making intelligent technology choices it is possible to achieve huge increases, potentially in the vicinity of 100 Mb/s, in available bandwidth at distances even beyond 23kft. This seems incredible as the standard DSL transmission curves fall off quickly with distance:



For example, rural & hamlet telephone system infrastructure often looks something like the following:



The message here is that, to achieve maximum DSL-based bandwidth, the FULL CABLE (24-pairs is often called a binder group in telecom speak) needs to be terminated at the first pedestal in the diagram above. If the bandwidth at that distance is only 4 Mb/s/pair the technology exists (G.Bond for DSL-layer or Ethernet Link Aggregation at the TCP layer) to aggregate the available bandwidth/pair into a single communications link. The result in the picture above would be 4 Mb/s x 24 pairs = 96 Mb/s that can be made available to all downstream customers.

As can be seen, the distances after that first pedestal are not insignificant either. The obvious solution is to re-bond all pairs going downstream to the next pedestal in the same manner that they were done from the Central Office in the first place. In these pictures it is often easy to forget the physical aspects of cabling… at the first pedestal (or cabinet) the twisted pairs that serve the nearest customers are not physically removed from the cable (binder). If the cable was installed correctly those pairs were simply cut at the punch block where they connect to the drop wires that travel the last 100 yards or so to the house. If they weren't cut it is called a "bridged tap" and is a real problem for xDSL-based systems. The point is that the physical pairs are still in the cable that goes down the road to the next pedestal. As can be seen in the picture above, it is possible to re-use those pairs to help in providing service to those customers who are downstream. If the distances happened to be as in the picture, all customers would have access to 96 Mb/s at all times. In this case, those beyond the first pedestal would not have ANY access to xDSL-based Internet services.

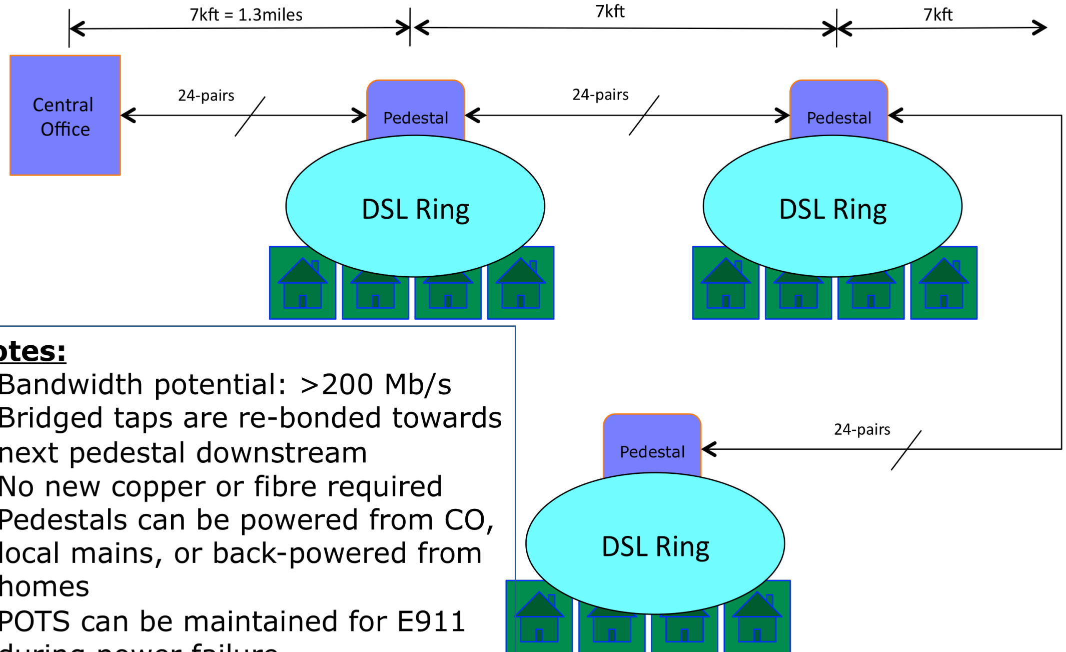
The bandwidth would be shared. As bandwidth in the telecom network is ALWAYS shared; it is just a question of at which point the sharing begins. Most people would probably say that being able to share a large bandwidth is better than having none at all.

As this bandwidth has been achieved over the EXISTING copper infrastructure the costs are a fraction of the cost of optical fiber-based alternatives and the deployment times are measured in days as opposed to months.

This system requires some intelligence in the pedestals and in the home modems that is not there today. It also requires mains power at the pedestals. To minimize delays in traffic that is sensitive to delays (e.g.: voice, video conferencing, etc.) it is necessary to have the system add/drop the traffic from upstream/downstream in the pedestals. To be cost efficient, the system needs to have a single piece of equipment that applies to however many of houses are served by each pedestal with a minimum of unused resources (e.g.: ports). Unused ports represent significant amounts of stranded capital investment for the Telcos. They are also a continuous electrical power drain for no benefit to the telco or customer. The core optical network between Central Offices (COs) solves this by using optical rings. This architecture also adds resiliency in the case of fiber cuts. Applying these same concepts to the access network is a technology called DSL Rings® (DSLR) that has been shown to work and is being developed by Genesis Technical Systems of Calgary, Canada & Coventry, UK.

The resultant network looks like the following:

Typical Rural Configuration



Notes:

- Bandwidth potential: >200 Mb/s
- Bridged taps are re-bonded towards next pedestal downstream
- No new copper or fibre required
- Pedestals can be powered from CO, local mains, or back-powered from homes
- POTS can be maintained for E911 during power failure

This architecture can solve the broadband divide in almost the entire US while also providing the deployment platform for next generation wireless services provided by femtocells.

The question then becomes: if spending $9 billion can deliver ultra high bandwidths such as those described above over completely brown-field copper infrastructure for likely 17 million of the 18 million unserved, why consider spending the same amount and delivering similar bandwidths over fiber-based infrastructure to probably much less than 1 million?